

chapter a number of "special analyses" are considered; they relate to methods of testing beetroot seed, to the examination of various materials used in sugar manufacture, and to particular cases of sugar analysis—e.g. the determination of raffinose.

The chief criticism suggested, on looking through the volume, is that a disproportionate amount of space is allotted to preliminary and incidental matters. Apart from an appendix of tabular material and the index, the book contains 294 pages. Of these only 120 are devoted to the real object of the work—beet-sugar making and its chemical control. The rest is taken up with accessory description, much of which is merely general elementary chemistry. This would be much better learned from an ordinary textbook. A "theory of the origin of limestone" (p. 40); a description of the metallurgy of iron (p. 48), or the chemistry of lead (p. 54); a dissertation on the molecular structure of the hydrocarbons (pp. 61–2): all these are rather out of place in a book devoted to sugar; or, at least, such things should not get the lion's share of the space. Whilst it is legitimate enough to discuss the general chemistry of the sugars, and even perhaps the theory of the polariscope, the rest of the matter in question gives one the impression of being largely "padding."

This apart, the book deals lucidly with the everyday problems of beet-sugar production, and should prove very useful to those for whom it is written.

C. S.

METHODS OF ROCK-ANALYSIS.

Analyse der Silikat- und Karbonatgesteine. By W. F. Hillebrand; translated by E. Wilke-Dörfurt. Zweite Auflage. Pp. xvi+258. (Leipzig: W. Engelmann, 1910.) Price 6 marks.

The Analysis of Silicate and Carbonate Rocks. A revision of Bulletin 305. By W. F. Hillebrand. Bull. 422, U.S. Geol. Survey. Pp. 239. (Washington: 1910.)

AS a consequence of the modern developments of petrology, accurate chemical analyses of rocks, and of the component minerals of rocks, have become more than ever an urgent desideratum; and it is a fortunate coincidence that there has been at the same time a decided revival of mineral chemistry, so long overshadowed by that of the carbon compounds. Not only is the discovery of new rock-types continually providing fresh material, but also it has to be recognised that the older rock-analyses, admirable in their own time, no longer suffice for the requirements of the present day. The best modern analyses have the advantage of greatly improved methods of separation; and, further, they aim at a much greater thoroughness of treatment, often including estimations of twenty or more constituents, instead of the eight or nine which satisfied Bunsen and Delesse.

In this work a leading part has been taken by the American chemists, and particularly those of the United States Geological Survey. In the last thirteen years four bulletins have been issued giving complete analyses of many American rocks, conducted in the

laboratory at Washington. In the first of these, some forty pages were devoted to a discussion of methods of analysis by Dr. Hillebrand. This part, considerably enlarged, was issued as a separate bulletin in 1900, a new edition appearing in 1907; and it is this last which has now been translated into German, with some revision and additions by the author. It has been closely followed by a revised edition of the original, so that the latest advances in this branch of practical chemistry are now accessible equally to German and English readers.

The methods which are here fully and clearly set forth are, in the main, those which the experience of the author and his colleagues has led him to prefer; but alternative methods are often given, especially when the first one requires complicated and costly apparatus. Many of the analytical methods described are, of course, familiar to the working chemist, but the author's matured judgment on their relative merits cannot fail to be of use; and, even apart from this critical discussion, it is a great convenience to have the scattered literature of the subject brought together and presented in systematic shape.

As an illustration of the author's treatment, we may select the estimation of ferrous iron, always a crux in rock-analyses (pp. 154–71). First comes a section, added in the present edition, pointing out the important error introduced by oxidation of the material during the process of grinding, and the devices by which this error may at least be minimised. This is followed by a comparison between Mitscherlich's sealed tube method of estimation and the hydrofluoric acid methods; the former is in general to be avoided, on account of the reducing action of sulphides present in the rock. Since, however, Mitscherlich's method is probably the best in those cases where it can safely be used, it is described, with important modifications suggested by experience. The general principle of the hydrofluoric acid method is then set forth, with a discussion of the chief sources of error and of the influence of sulphides, vanadium, and carbonaceous matter on the determination of the ferrous iron. Finally, the author describes the method itself in its various modifications, as advocated by Cooke, Pratt, and Treadwell, respectively.

Twenty years ago the petrologist who did not perform his own chemical analyses felt that he was delegating part of his legitimate task to another. A more exacting standard has made a division of labour, as regards complete rock-analyses, almost inevitable, and Dr. Hillebrand's manual is accordingly addressed to the chemist rather than the petrologist. On the other hand, few of us are in the advantageous position of the United States Geological Survey, which can command the services of six or eight skilled specialists; and it is also to be remembered that one complete analysis demands as much time and labour as, perhaps, three of a less ambitious kind. Some petrologists will be of opinion that there is still a place for rock-analyses, conducted according to the best methods, but including estimations of only a moderate number of constituents.

If the petrologist cannot make his own analyses, he

should, none the less, be competent to interpret them with judgment, and we should have been grateful to the author for some guidance in this matter. Everybody knows, for instance, that the silica is likely to be more correctly determined than the alumina, and so in a general way for other constituents; but a summary discussion by a skilled mineral analyst of the probable errors attaching to the several chief constituents of igneous rocks would be very welcome.

A. H.

NEW GEOGRAPHICAL BOOKS.

- (1) *Distant Lands. An Elementary Study in Geography.* By H. J. Mackinder. Pp. xvi+296. (London: Geo. Philip and Son, Ltd., n.d.) Price 2s.
- (2) *A First Book of Physical Geography.* By W. M. Carey. The First Books of Science Series. Pp. viii+150. (London: Macmillan and Co., Ltd., 1910.) Price 1s. 6d.
- (3) *A Physiographical Introduction to Geography.* By Prof. A. J. Herbertson. The Oxford Geographies. Pp. 120. (Oxford: The Clarendon Press, 1910.) Price 1s. 6d.
- (4) *Geology.* By Prof. J. W. Gregory. Dent's Scientific Primers. Pp. 140. (London: J. M. Dent and Sons, Ltd., n.d.) Price 1s. net.
- (5) *An Economic Atlas.* By J. G. Bartholomew, with an introduction by Prof. L. W. Lyde. Pp. xii+64. (Oxford: The Clarendon Press, 1910.) Price 3s. 6d. net.
- (6) *Devonshire.* By F. A. Knight and Louie M. (Knight) Dutton. Cambridge County Geographies. Pp. xii+245. (Cambridge: University Press, 1910.) Price 1s. 6d.
- (7) *Dorset.* By A. L. Salmon. Cambridge County Geographies. Pp. ix+154. (Cambridge: University Press, 1910.) Price 1s. 6d.
- (8) *Derbyshire.* By H. H. Arnold-Bemrose. Cambridge County Geographies. Pp. x+174. (Cambridge: University Press, 1910.) Price 1s. 6d.
- (9) *A Systematic Geography of Asia.* By G. W. Webb. Pp. vi+100. (London: Methuen and Co., Ltd., 1910.) Price 1s.

MR. MACKINDER has now brought his studies in the teaching of geography by means of its correlation with history to a penultimate stage. Approximately half this book (1) deals with history in some form, either with the world-movements of peoples, such as the Magyars or Turks, or with the history of discovery connected with the names of Marco Polo or Cook. There is, as yet, little political geography, all of which is promised in the final volume of the series, and the treatment tends to ignore the possibilities of correlation with other subjects in the school curriculum. Most pupils learn something of the value of coordinates in relation to the fixing of the position of points in space, and provided the problems of latitude and longitude be postponed, their adequate treatment follows as a special case of this method of recording the positions of points; Mr. Mackinder approaches these problems by

way of an account of the work of Eratosthenes and of the eclipse of the sun at the battle of Arbela. The book makes an interesting reader, and is profusely illustrated with maps and diagrams, some of which imply a geographical knowledge which the text does not call upon the pupils to utilise.

The beginner in any study should know the technical language in which the phenomena of that subject are described: hence the utility of the three books which represent the physiographic aspect of geography. Mr. Carey (2) brings to his explanation of the terms of physical geography, and of the "principles which underlie and control the development of the physical conditions" of any region, the methods of the successful teacher. He gives a series of practical exercises which familiarise the pupil with the matter to be considered; he then presents the facts in their usual setting, and elucidates the technical terms and the principles, and, finally, asks questions which force the pupil to realise the meaning of the matter studied. The references are usually to parts of the British Isles.

Prof. Herbertson (3) attempts a succinct summary of world geography. The text and the illustrations require the active cooperation of the teacher with the pupil at every step, and thus the work is much more difficult for the pupil than either of the two previously mentioned. For example, Mr. Carey makes the pupil draw an isotherm, and then discusses the interpretation of typical isotherms for the British Isles; Prof. Herbertson deals with world isotherms at once, assuming that the pupil knows how they are made and what they mean. Prof. Herbertson gives a useful concluding chapter on map nets, while there is an appendix containing many revision questions contributed by Miss Kirk.

Prof. Gregory (4) contributes an explanation of the technical terms employed in geology, which should serve as an excellent introductory primer, but there is lacking the apparatus of exercise and question for school use. Probably, of all subjects, geology requires the assistance of an expert who can suggest and advise as to the particular ways in which practical work in the field should be performed, and the beginner, whether school pupil or private student, would be greatly helped were this primer provided with guidance in this direction.

The "Economic Atlas" (5) is a re-issue of the "School Economic Atlas," with slight modifications. Prof. Lyde, in an introduction, limits economic geography to a study of the earth in relation to man, and provides a series of valuable hints as to the study of the maps which follow. In this introduction Prof. Lyde claims that the water-parting between the Atlantic and the Indo-Pacific Oceans divides the world into two fairly equal parts, and in an inset map the water-parting is shown by a black line on a map of the world, having the Pacific Ocean in the middle. There is no suggestion of the internal drainage systems of the continents, nor of the drainage into the Arctic Ocean. A consideration of the map and text, apart from a consideration of these other facts, would probably lead to erroneous conclusions. The introduction